CLAIMS OF THE APPLICATION

1. (Original) An optical information reproducing apparatus for recording or reproducing information by controlling rotation of an optical disk so as to provide a constant linear velocity by changing a rotation frequency in accordance with a radial-direction position of an optical spot , said apparatus comprising:

a circuit configured to control rotation of the optical disk;

a focusing servo control circuit and a tracking servo control circuit for the optical spot; and

a circuit configured to adjust a servo-loop gain of tracking servo control in accordance with the radial-direction position of the optical spot.

2. (Original) An apparatus according to Claim 1, wherein said circuit configured to adjust the servo-loop gain of tracking servo control adjusts the servo-loop gain in accordance with a stationary rotation frequency at the radial-direction position of the optical spot.

3. (Original) An apparatus according to Claim 1, wherein a recording region of the optical disk is divided into a plurality of zones in a radial direction, wherein said rotation control circuit controls rotation of the optical disk so that a linear velocity is substantially constant between respective zones by changing the rotation frequency for each zone, and wherein said circuit configured to adjust the servo-loop gain of tracking servo control adjusts the servo-loop gain in accordance with a stationary rotation frequency of each zone.

4. (Original) An apparatus according to Claim 1, wherein said circuit configured to adjust the servo-loop gain of tracking servo control adjusts the servo-loop gain by setting a gain proportional to eccentric acceleration corresponding to the radial-direction position of the optical spot.

5. (Original) An apparatus according to Claim 1, wherein said tracking servo control circuit is controlled by a sampling frequency that changes in accordance with the radial-direction position of the optical spot, and wherein said circuit configured to adjust the servo-loop gain of tracking servo control performs gain adjustment in accordance with the radial-direction position of the optical spot in a state in which a coefficient of a phase compensation filter included in said tracking servo control circuit is fixed.

6. (Original) An apparatus according to Claim 1, wherein the optical disk is a sample servo disk having a servo region provided radially from the center of the optical disk, and wherein said circuit configured to adjust the servo-loop gain of tracking servo control performs gain adjustment in accordance with the radial-direction position of the optical spot in a state in which a coefficient of a phase compensation filter included in said tracking servo control circuit is fixed.

7. (Original) An apparatus according to Claim 1, wherein said tracking servo control circuit is controlled with a constant sampling period in the entire region of the optical disk, and wherein said circuit configured to adjust the servo-loop gain of tracking servo control

adjusts the servo-loop gain by adjusting a coefficient of a phase compensation filter included in said tracking servo control circuit and a gain in accordance with the radial-direction position of the optical spot.

8. (Original) An apparatus according to Claim 1, wherein a recording region of the optical disk is divided into a plurality of zones, wherein said rotation control circuit controls rotation of the optical disk so that a linear velocity is substantially constant between respective zones by changing the rotation frequency for each zone, and makes zones among the plurality of zones, each having a rotation frequency within a predetermined rotation-frequency range a block, and wherein said circuit configured to adjust the servo-loop gain of tracking servo control adjusts the servo-loop gain for each block.

9. (Original) An apparatus according to Claim 1, wherein said circuit configured to adjust the servo-loop gain of tracking servo control adjusts the servo-loop gain so that when a servo gain at a highest rotation frequency Wmax is represented by Gmax, and a rotation frequency is represented by Wcurr, a servo gain Gcurr satisfies the following relationship:

$$Gcurr \fallingdotseq Gmax \times Wcurr/Wmax.$$

10. (Original) An apparatus according to Claim 1, wherein said focusing servo control circuit comprises a circuit configured to adjust the servo-loop gain of focusing servo control, and wherein when said circuit configured to adjust the servo-loop gain of tracking

servo control changes the servo-loop gain of tracking servo control with a predetermined ratio, said circuit configured to adjust the servo-loop gain of focusing servo control changes the servo-loop gain of focusing servo control with a ratio proportional to the root of the predetermined ratio.

11. (Original) An optical information reproducing apparatus for recording or reproducing information using an optical spot by controlling rotation of an optical disk so as to provide a constant linear velocity by changing a rotation frequency in accordance with a radial-direction position of the optical spot, said apparatus comprising:

a circuit configured to control rotation of the optical disk;

a focusing servo control circuit and a tracking servo control circuit for the optical spot; and

a circuit configured to adjust a servo-loop gain of focus servo control in accordance with the radial-direction position of the optical spot.

12. (Original) An apparatus according to Claim 11, wherein said circuit configured to adjust the servo-loop gain of focusing servo control adjusts the servo-loop gain in accordance with a stationary rotation frequency at the radial-direction position of the optical spot.

13. (Original) An apparatus according to Claim 11, wherein a recording region of the optical disk is divided into a plurality of zones in a radial direction, wherein said rotation control circuit controls rotation of the optical disk so that a linear velocity is substantially

constant between respective zones by changing the rotation frequency for each zone, and wherein said circuit configured to adjust the servo-loop gain of focusing servo control adjusts the servo-loop gain in accordance with a stationary rotation frequency of each zone.

14. (Original) An apparatus according to Claim 11, wherein said circuit configured to adjust the servo-loop gain of focusing servo control adjusts the servo-loop gain by setting a gain proportional to eccentric acceleration corresponding to the radial-direction position of the optical spot.

15. (Original) An apparatus according to Claim 11, wherein said focusing servo control circuit is controlled by a sampling frequency that changes in accordance with the radial-direction position of the optical spot, and wherein said circuit configured to adjust the servo-loop gain of focusing servo control performs gain adjustment in accordance with the radial-direction position of the optical spot in a state in which a coefficient of a phase compensation filter included in said focusing servo control circuit is fixed.

16. (Original) An apparatus according to Claim 11, wherein said focusing servo control circuit is controlled with a constant sampling period in the entire region of the optical disk, and wherein said circuit configured to adjust the servo-loop gain of focusing servo control adjusts the servo-loop gain by adjusting a coefficient of a phase compensation filter included in said focusing servo control circuit and a gain in accordance with the radial-direction position of the optical spot.

17. (Original) An apparatus according to Claim 11, wherein a recording region of the optical disk is divided into a plurality of zones, wherein said rotation control circuit controls rotation of the optical disk so that a linear velocity is substantially constant between respective zones by changing the rotation frequency for each zone, and makes zones among the plurality of zones, each having a rotation frequency within a predetermined rotation-frequency range a block, and wherein said circuit configured to adjust the servo-loop gain of focusing servo control adjusts the servo-loop gain for each block.

18. (Original) An apparatus according to Claim 11, wherein said circuit configured to adjust the servo-loop gain of focusing servo control adjusts the servo-loop gain so that when a servo gain at a highest rotation frequency Wmax is represented by Gmax, and a rotation frequency is represented by Wcurr, a servo gain Gcurr satisfies the following relationship:

$$Gcurr \fallingdotseq Gmax \times \sqrt{Wcurr / Wmax}\ .$$

19. (Original) An apparatus according to Claim 11, wherein said tracking servo control circuit comprises a circuit configured to adjust the servo-loop gain of tracking servo control, and wherein when said circuit configured to adjust the servo loop gain of focusing servo control changes the servo-loop gain of focusing servo control with a predetermined ratio, said circuit configured to adjust the servo-loop gain of tracking servo control changes the servo-loop gain of tracking servo control with a ratio proportional to the root of the predetermined ratio.

20. (Original) An apparatus according to Claim 1, wherein said circuit configured to adjust the servo-loop gain of tracking servo control adjusts the servo-loop gain in accordance with a transient change of the rotation frequency caused by movement of the optical spot in a radial direction.

21. (Original) An apparatus according to Claim 11, wherein said circuit configured to adjust the servo-loop gain of focusing servo control adjusts the servo-loop gain in accordance with a transient change of the rotation frequency caused by movement of the optical spot in a radial direction.